

AN OVERVIEW OF BROWN BEAR MANAGEMENT IN SIX EUROPEAN COUNTRIES

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Abstract: During 1995–96, we surveyed members of organizations and governmental agencies to construct an overview of brown bear (*Ursus arctos*) management in Austria, Italy, Norway, Romania, Slovenia, and Sweden. From the results, we summarized the extent of brown bear damage in each country, identified which organizations were involved in bear management, and which duties they fulfilled. We conducted 94 interviews using a standardized questionnaire. Bear damage in most countries was <20% of all reported wildlife damage and totaled <US \$300,000/year (except Norway, averages based on data between 1984–95). Most bear damage incidents involved sheep and beehives and were concentrated in July and August for sheep and August–October for beehives. All 6 countries offered damage compensation programs, but satisfaction with such programs varied among countries. Four of 6 countries offered financial incentives for taking preventive measures such as protecting beehives with electric fencing. Brown bear management in Europe involved both private and governmental agencies with varying degrees of cooperation. A conservation management approach, practiced in Romania, Sweden, and Southern Slovenia, was characterized by economic use of the bear population. These countries had viable bear populations. Romania and Southern Slovenia fed bears to increase the huntable population, which we viewed as a utilitarian management scheme. In contrast, a preservationist approach was observed in Norway, Italy, Northern Slovenia, and Austria, where bear numbers were low; this approach included yearlong protection, low population numbers, and no feeding of bears. Dealing with problem bears in Europe was a difficult issue because the elimination of even a single bear threatens small populations. A successful bear management program in Europe seemed to include good communication and cooperation between involved agencies, stakeholders, and the public, a fast, adequate compensation program, and efficient problem bear management.

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Historically, brown bears were distributed throughout Europe (Dandaletche 1989). Since the twelfth century, forest clearing for agriculture and livestock grazing has increasingly fragmented brown bear habitat. Bounties on bears existed into the nineteenth century and contributed to the reduction or even eradication of populations in many places. Today, most European bear populations are small and isolated (Mertzanis 1989, Zunino 1989) (Fig. 1, Table 1).

To preserve some very small populations and to increase genetic diversity, bears from other European populations have been released in Austria and the Pyrenees. In Austria, a few males from the Balkans naturally dispersed to the Alps, but females were released by the WWF (World Wildlife Fund) Austria in 1991 (WWF Austria 1991). Unfortunately, bear population growth typically increases the likelihood of bear–human interactions, particularly where habitat patches are small and fragmented. Bears lose their natural fear of people as interactions become more frequent (Herrero 1985), and over time, the likelihood of problems like livestock depredation or crop damage increase as well.

Successful brown bear conservation in Europe is tied to public acceptance of damages caused by bears. In 1994, an unusually high incidence of sheep depredation and beehive damage in central Austria resulted in the killing of 2 bears. As bear numbers were low in this population (and in most European populations), the elimination of problem bears was not a desired or popular solution.

These events led to the formation of the Austrian Bear Management Group (ABMG), comprised of the Munich Wildlife Society (WGM), the WWF Austria, and the Institute for Wildlife Research (IWF) at the Bodenkultur University of Vienna. The ABMG was responsible for designing a bear management plan for Austria compatible with achieving conservation goals that outlines procedures for dealing with bear damage and problem bears.

This study was designed to survey and summarize the extent of brown bear damage in selected European countries, to compare bear management policies and administration, and to link those policies to public acceptance of bears. The project was initiated by the WGM, a member of the ABMG, as an aid in designing the Austrian bear management plan.

METHODS

We contacted government agencies, hunting clubs, and non-governmental organizations (NGO's) in 6 European countries (Austria, Italy [Abruzzo region only], Norway, Slovenia, Sweden, and Romania, Table 2). Countries for the study were selected by the WGM based on the availability of personal contacts in these countries to help with the survey during field seasons in 1995 and 1996. From each organization we requested data on brown bear population size, damage to livestock by bears, and damage by other wildlife species. Agencies responsible for collecting these data varied by country, but included

Table 1. Status of brown bears, estimates of population size, and density in 6 European countries.

Country	Area	Status	Year:		Source
			Population estimate	Estimated density	
Romania	Carpathian Mountains	hunted since 1990 closed season Jan 15–Mar 1	1950:1,000	2/10 km ²	Almasan (1994) Weber (1990) Weber (1990)
			1990:7,450	8/10 km ² (max)	
			1993:6,000		
Norway	Throughout	protected since 1973	1965:25–50		Pulliainen (1989) Pulliainen (1989)
			1982:20–30		
Sweden	North of 60°	protected since 1912 hunted again since 1943	1976:400–600	0.012/10 km ²	Pulliainen (1989) Swenson et al. (1994)
			1994:619		
Italy	Central region (including Abruzzo National Park) Trentino National Park	protected since 1939	1970:70–100	0.7/10 km ²	Zunino (1981) Strensén (1990) Knauer (1993) Knauer (1993)
			1983:50–80		
			1976:10 1994:4	0.13/10 km ²	
Slovenia	Dinarian mountains	hunted, closed season May 1–Sep 30	1991:300–400		Adamic (1991)
Austria	Southcentral	protected	1991:11		WWF Austria (1994) WWF Austria (1994)
			1994:20		

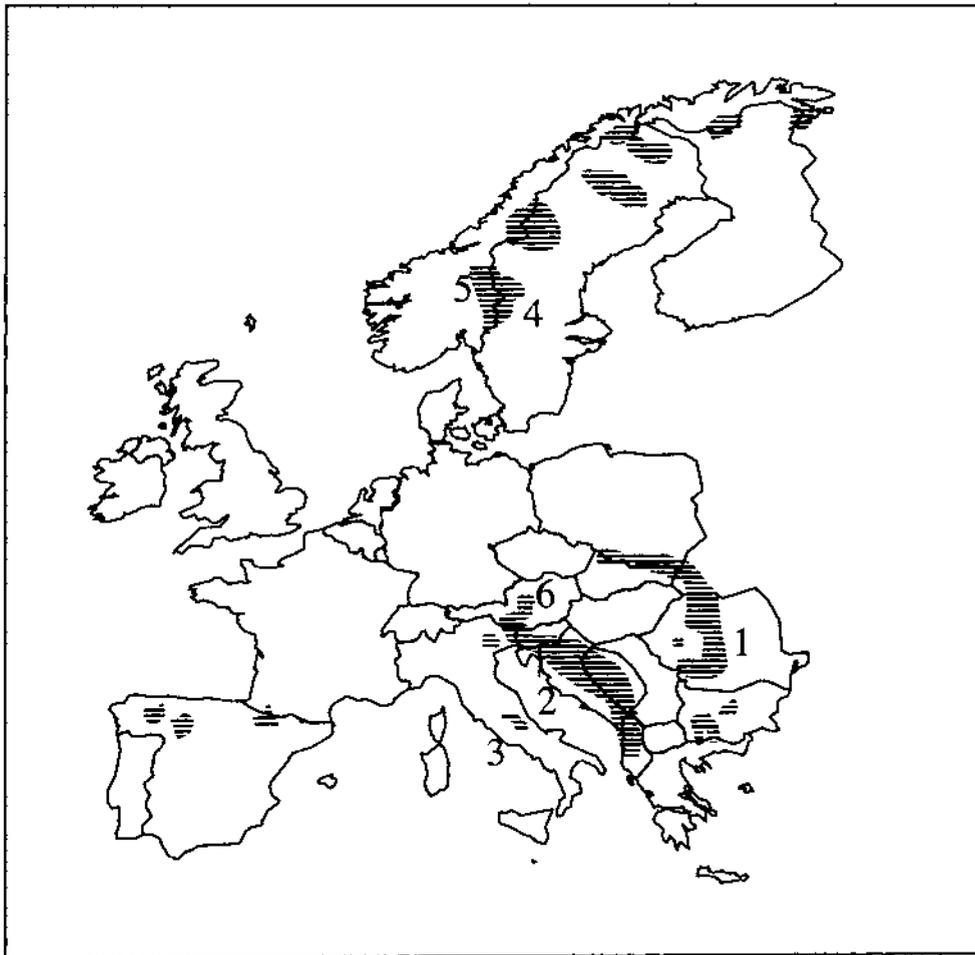


Fig. 1. Brown bear populations in Europe as of 1996. Study areas included (1) Romania, (2) Slovenia, (3) Abruzzo region of Italy, (4) Sweden, (5) Norway, and (6) Austria.

Table 2. People interviewed by country and occupation to investigate brown bear management in 6 European countries, May 1995–Nov 1996.

Occupation	Romania	Slovenia	Italy	Norway	Sweden	Austria	Total
Administrative official	4	4	0	5	1	7	21
Local wildlife manager	2	4	3	3	0	3	15
Shepherd or farmer	7	4	8	3	0	11	33
Local resident	9	0	0	0	0	0	9
Researcher	9	1	2	2	0	2	16
Total	31	13	13	13	1	23	94

Ministries of Agriculture, Forestry, or Environment; national or local hunting associations, and the WWF Austria. Data available on bear population size ranged from estimates of density based on mark–recapture studies (Sweden and Norway) to counts of individual bears feeding at bait stations in the spring (Romania and Slovenia). Austria and Italy reported estimates of population size but not method of estimation.

Data on annual livestock damage were provided in various formats, including: (1) the amount of annual monetary compensation paid to farmers; (2) number of incidents reported/month; and (3) number of animals or beehives destroyed. Years for which data were available varied by country (Table 3). Data for central Italy covered only the area administered by the Italian Forest Service (IFS), as Abruzzo National Park did not release data. We summarized the percent of all damage done by bears versus other wildlife and the monetary value of bear damage. We identified the peak damage season and the types of livestock affected in each country. Comparisons of damage by bears among countries were based on the number of animals killed or number of beehives destroyed/month, as these data were available for all 6 countries.

During May 1995–November 1996, we interviewed 94 wildlife managers, hunters, government officials, and farmers in the 6 countries, using 1 standardized questionnaire for managers, hunters, and government officials (Table 2, Appendix 1) and another for farmers and shepherds (Appendix 2). We sampled farmers we encountered on the road or while hiking in the backcountry. A more random approach was not possible, as there was no list available of all farmers residing in the survey areas.

Questions were designed to obtain the following information: (1) the organizational structure through which bear management was administered in each country; (2) the types of bear-related problems in each country (e.g., habituation, food-conditioning, property damage); (3) how bear problems were addressed by authorities; (4) whether a bear management plan existed and its contents; (5) the perceived strengths and weaknesses of each management approach; and (6) public attitudes toward bears; and (7) public satisfaction with governmental management and damage compensation.

We translated all interviews into English with the help of a translator if interviewees did not speak English or German. We used content analysis (Babbie 1992) to summarize responses, in which intent rather than specific wording was used to categorize answers. We felt this was appropriate, as many people did not answer in English and answers had to be interpreted by a translator or ourselves.

RESULTS

Management of Problem Bears and Bear Damage

Types and Cost of Bear Damage.—The estimated monetary value of annual bear damage varied greatly across Europe; central Italy, Austria, and Slovenia averaged U.S. \$53,000, whereas Norway averaged U.S. \$300,000, and Sweden averaged U.S. \$700,000 (Table 3). A monetary value could not be estimated for Romania due to high inflation rates during the years for which data were available.

Norway reported paying the highest annual damage compensation, despite having the smallest estimated bear population. Compensation to Norwegian farmers was primarily for sheep depredation (Table 4; 97% of domestic animals reported killed by bears were sheep). Incidents involving bears killing livestock accounted for 9–19% of all the registered wildlife damage in Norway from 1984–93 and increased steadily (9–17%) during 1988–93.

In contrast, bear damage reported in Sweden involved primarily domestic reindeer and accounted for only 3–12% of animals killed by all predators (Swedish Environmental Protection Agency [EPA] 1993), despite its much larger bear population. Damage to sheep was minimal and occurred mainly in central Sweden (A. Bjärvall, Swedish EPA, Stockholm, personal communication, 1996).

In Slovenia, bear damage was reported separately for a southern core area containing most of the bear population and a northern area, thought to be primarily a corridor for bear dispersal to the Alps (Kaczensky et al. 1995;

Table 3. Mean annual compensation paid to farmers for brown bear damage (U.S. dollar equivalent) in 6 European countries, 1984-95, and current estimates of bear population size.

Country	Years of available data	Damage payments (US \$)	Sheep population size ^a	Bear population size
Romania	1987-92	N/A ^b	13,000,000	6,000
Southern Slovenia	1992-95	5,000	13,000	600 ^c
Northern Slovenia	1992-95	21,000	25,000	25 ^c
Central Italy	1986-90	32,000	212,500	50-80
Sweden	1990-94	300,000	80,000	600
Norway	1984-93	700,000	2,254,000	25
Austria	1990-95	30,000	34,896	20-25

^a Austrian Bureau of Census, 1995. Italian Bureau of Census, 1995, Norwegian Bureau of Census, 1990, Romanian Bureau of Census, 1993, Slovenian Bureau of Census, 1995.

^b Value cannot be assigned due to the high inflation since 1971.

^c Differs from Table 1 because this more current estimate has not been published. Source: Slovenian Hunters Association, Ljubljana, Slovenia, unpublished data.

P. Kaczensky, Munich Wildlife Society, Linderhof, Germany, unpublished data; Ministry of Forestry and Agriculture, Ljubljana, Slovenia; unpublished data). Paradoxically, most bear damage in Slovenia occurred outside the core area, despite estimates of only 25-30 resident bears outside versus about 300-400 animals inside the core area (Table 3). Most complaints involved damage to sheep or goats.

In central Italy, 97.7% of all claims for bear damage from 1980-88 were registered in 1 province (L'Aquila; Fico et al. 1993). There, livestock losses to bears accounted for only 0.03% of all livestock losses reported; sheep kills ($n = 345$) and beehive destruction ($n = 141$) comprised most of the bear damage.

In Austria, bear damage increased steadily from when bears were reintroduced to the Alps in the late 1980s until 1994, when 198 incidents of livestock and beehive damage were reported. That year, 2 bears in central Austria alone killed 60 sheep, 2 goats, and 1 cow, and, in addition, drained several fishponds. After these 2 bears were killed, reported bear incidents involving livestock or bees decreased to 78 in 1995. In 4 of 6 years, bears destroyed more beehives than sheep (WWF Austria, Vienna, unpublished data).

In all countries, bears caused <20% of all reported damage due to wildlife. Except in Sweden, most incidents involved sheep and beehives (Table 4). Sheep damage in all study countries was concentrated in July and August when sheep grazed on open meadows, whereas beehives suffered the most damage in late summer and fall. Sheep damage was highest in Norway, which has as many sheep as Sweden but very few bears (Table 3). Sheep husbandry methods included free-roaming, unguarded sheep in Norway, Austria, and northern Slovenia, sheep in fenced enclosures in Sweden; and sheep guarded by shepherds in Romania, southern Slovenia, and Italy.

Damage Compensation Programs.—All countries surveyed had some form of damage compensation program, administered, sometimes jointly, by multiple units of government or NGO's (Table 4). In Romania, until the 1992 revolution, local governments paid compensation after foresters or police confirmed that bear damage had occurred. Compensation was paid according to market value, determined by the Ministry of Agriculture. Six of 8 wildlife managers stated that currently there is no regulated compensation system, but shepherds can bring their dead livestock to court and claim compensation. However, all shepherds interviewed ($n = 7$) agreed that the amount of money compensated is negligible and usually not worth the effort of filing a claim.

In Slovenia, the Ministry of Agriculture and Forestry compensated damage by bears at market value outside of the southern bear population core area (Adamic 1991). A local damage commission had to confirm the incident. Inside the core area, local hunt clubs or game reserves covered 2/3 of the damage payments, while the Ministry of Agriculture and Forestry paid 1/3 of each claim.

In central Italy, Abruzzo National Park introduced a compensation system as early as 1923. During 1968-74, the WWF Italy paid for damages in and around the park. At present, compensation for livestock or apiary damage within the park is paid by the park, which is funded by the Ministry of Agriculture. Damages within the park are rare (5 of 5 interviewed), but specific data were not available. Bear damage outside the park must be inspected and verified by an Italian Forest Service employee and evidence (e.g., a carcass) must be found for farmers to receive compensation at full market price. All interviewees ($n = 5$) agreed that claims are processed very slowly; often it takes 4-8 years to receive reimbursement. If the annual budget for compensation is exhausted, claims are transferred into the next fiscal year. Italy was

Table 4. Brown bear damage and compensation in 6 European countries, 1996, according to interviews from each country.

	Austria	Italy (Abruzzo)	Norway	Northern Slovenia	Southern Slovenia	Sweden	Romania
Damages Type	sheep bees fish	sheep bees cows horses	sheep	sheep	sheep goats bees few cows	reindeer sheep	sheep goats bees few cows and 1 orchards
Peak time	Jun Aug	Jul Sept	Aug	Aug	Jun Aug	Jul Aug	Jun Aug
Compensation Present	yes	yes	yes	yes	yes	yes	yes
Proof Adequate ^a	yes	yes	yes	yes	yes	yes	yes
Problems	Upper Austria 50% reimbursement of market price	yes yes yes up to 8 years wait	yes yes yes	yes yes yes	yes yes yes	yes yes yes	no little mone much paperw not availabl all farmer
Who pays	Hunters' Association insurance, WWF, National Park	regional Forest Service	county	Ministry of Forestry	Hunters' Association, Ministry of Forestry	Environmental Protection Agency	county
Evaluator	bear specialist, veterinarian, hunters	forester, veterinarian	carnivore specialist, technicians	foresters	foresters	carnivore specialist, hunters	police
Source of money	membership dues, national budget	Forest Service, taxes	national budget, taxes	national budget, taxes	membership dues, national budget	national budget, taxes	national bud
Damage prevention What kind	fencing of hives	sheepherding dogs	fencing, removing sheep from the pastures early	fencing of hives, herding dogs	fencing of hives, herding dogs	herding dogs	fencing of hi herding do,
Subsidized	some	no	yes	some	some	yes	no

^a Adequate was considered a reimbursement at market value of lost property or livestock.

the only country where compensation was tied to husbandry practices. During 1992–93, damage was only compensated if farmers proved that specific preventive measures had been taken (e.g., ≥ 1 shepherd/100 sheep and sheep were enclosed at night). The new law drew many complaints from shepherds and was abolished in 1994 (K. Cozza, R. Fico, and L. Battistini, 1995, *Wildlife predation on domestic livestock in central Italy: a management perspective*, Symposium on Human–Wildlife Conflicts, Bieczady, Poland; R. Fico, Italian Forest Service, Abruzzo, Italy, personal communication, 1996).

In Sweden, since July 1995, individual county governments administered all damage complaint programs. Prior to 1995 in central and southern Sweden, damages were handled by the Swedish EPA. Damage had to be verified by a local police officer, veterinarian, or member of the Swedish Hunters Association, and the amount of compensation was approved by the Swedish Farmers Association. Compensation required that the animal be found, except for bear damage to sheep near previously verified kills.

In Norway, the Directorate for Nature Management (DNM) under the Ministry of Environment allocated damage compensation to individual counties based on the number of incidents reported the preceding year. Currently, regulations require that a carnivore specialist inspect and report bear damage to the governor's office at the time it occurs. Farmers file for compensation for all carnivore damage experienced during the year by November 1 and usually receive reimbursement within 2–3 months. Farmers can be compensated at 75% value for missing sheep if documented bear kills occurred in the area that year. Two of 10 interviewees stated that farmers are compensated for 90–95% of all missing sheep, even though some likely die of diseases and other causes but are never found.

In Austria, each state had an individual system of compensation prior to the bear management plan of 1997 (Kaczensky 1996). Currently, there is a national compensation system in place in which damage claims have to be confirmed by an official. All 9 farmers interviewed in the states of Lower Austria and Styria indicated that they were satisfied with the current compensation system. We did not interview farmers of Upper Austria, where only 50% compensation was paid prior to 1997.

Damage Prevention.—Four of 6 countries offered financial incentives for taking preventive measures (e.g., building electric fences around beehives, reimbursing farmers for hay if they removed sheep from summer pastures early; Table 4). Typically, preventive measures were only subsidized where extensive damage had been recorded previously. The practice of feeding bears in re-

mote areas to draw them away from people was common in Slovenia, Italy, and Romania, but was not subsidized (Kaczensky 1996, $n = 15$ interviews). In Romania and Slovenia, bait sites were maintained by local hunting clubs, whereas in Italy, Abruzzo National Park maintained the sites. Guarding sheep with shepherds and dogs was another preventive measure practiced in Romania and Italy that was unsubsidized. In Sweden and parts of Austria and Slovenia, farmers kept sheep in enclosures close to villages but did not guard them.

Problem Bear Management.—Countries that did not have regular hunting seasons experienced difficulties eliminating problem bears. The Bern Convention Treaty of the European Union prohibited the killing of brown bears in endangered populations (e.g., Austria, Norway, Italy; European Economic Community 1981; Munich Wildlife Society 1997). There, wildlife managers or police could obtain shooting (hunting) permits from their agencies or county governments if bears threatened people or property. Permits for females with cubs were issued only if they posed a serious threat to people's lives or had already injured somebody. However, wildlife managers (Norway, Slovenia, and Austria [$n = 10$]) complained that obtaining a permit took too long and that often a bear escaped from a problem area before action was taken.

In countries where bears were hunted (southern Slovenia, Romania, Sweden), a problem bear could be shot within the legal harvest quota during the hunting season. Outside the hunting season, the responsible management organization could issue a special shooting permit (Table 5). Permits were sold to hunters at a high price (for foreign hunters up to U.S. \$20,000 in Romania; O. Ionescu, Ministry of Environment, Brasov, Romania, unpublished data) and provide a source of income for the local management agency.

In Austria, the ABMG used aversive conditioning for habituated bears and has been successful in reversing nuisance behavior (F. Knauer, WGM, Linderhof, Germany, personal communication, 1996). Relocations in Europe are not feasible because of dense human populations.

Population Management

Romania, southern Slovenia, and Sweden are thought to have large bear populations (>300 animals) that are stable or growing (Table 1; Kaczensky 1996, Munich Wildlife Society 1997). Bear populations in Norway, northern Slovenia, and Austria are considered small (<40 animals), but they are growing due to expanding larger populations in neighboring countries (Table 1). The population in central Italy is thought to be small and declin-

ing (Sørensen 1990, R. Fico, IFS, Abruzzo, Italy, personal communication, 1996).

Brown bear management programs in the 6 countries were administered either entirely by the governments (Norway, Sweden, and northern Slovenia) or jointly by governmental and non-governmental organizations (Austria, Italy, southern Slovenia, and Romania). In Slovenia, Austria, and Romania, national hunters' associations played an important role in bear management activities by providing damage compensation insurance (Austria and Slovenia) and assisting with population monitoring, hunting, and supplemental feeding (Romania and Slovenia). In addition to hunting groups, WWF Austria provided money for population research by telemetry studies and additional money for compensation programs (WWF Austria 1991, 1994).

Of the 6 European countries included in this study, only Norway had a comprehensive bear management plan (Table 5; Austria has had a plan since 1998, after the study was completed). Officials in all other countries stated that they were in the process of developing one. At that time, Italy had no written policy regarding bear management, and Romania and Slovenia had only bear harvest plans. Sweden maintained a comprehensive plan for managing bear-reindeer (domestic) interactions.

Problems Identified in Current Management Programs

In Romania, survey respondents reported that effective management was often hindered by lack of equipment and funds. Frequently, game wardens travel on foot or horseback and are responsible for ≥ 40 km². Areas are very remote and difficult to reach quickly. Cooperation between local residents or shepherds and bear managers was considered poor (16 of 31 interviewed). In addition, 5 of 7 shepherds interviewed in Romania complained that hunters and wildlife managers were not very concerned about their problems with bears and would rather have a large population of bears that could be sold as trophies. Eight of 15 wildlife officials agreed that they preferred killing problem bears during the hunting season when the pelt of the animal is better quality and sells for more money. Habituation and food-conditioning in Romanian brown bears occurs frequently. Although 8 of 15 officials interviewed did not believe that Romania had a problem with habituated, garbage-eating bears, 100% ($n = 16$) of shepherds and locals interviewed reported seeing bears at garbage dumps next to houses and in villages regularly. Several ($n = 4$) mentioned that under the communist regime they did not dare complain, and even now do not think that government authorities would change the situation if they complained. Ironically, 10

of 16 local people did not believe that bears at garbage dumps were dangerous. However, 13 out of 18 officials interviewed agreed that injury to people is a major problem with bears in Romania, concerning mainly shepherds defending their sheep and confronting bears. We observed people approaching bears, including mothers with cubs, as they fed at garbage cans in Brasov, Romania, in 1996.

In Slovenia, the management problems identified in surveys were that (1) damage is not reported to a central agency ($n = 4$ of 10 interviewed), and (2) damage compensation rules for the core bear management area and for the outside area differed ($n = 4$ of 10). Most wildlife managers ($n = 9$ of 10) complained that it took too long to issue special kill permits for problem bears. In addition, they complained that there was no special training for wildlife officials (hunters and state employees) regarding brown bear behavior and management; most learned on the job. The government currently is trying to organize regular training for managers (M. Adamic, Slovenian Institute for Forest Research and Management, Ljubljana, Slovenia, personal communication, 1995).

Management problems in Austria arose from states having different regulations for dealing with problem bears and compensating farmers for damage. For example, when a bear was damaging property in 1994, kill permits had to be issued in 2 different states by several different counties individually. Each permit was difficult to obtain, and some counties did not issue one at all. The bear was eventually shot in self-defense in a county without a permit (F. Knauer, WGM, Linderhof, Germany, personal communication, 1996). Another major problem for brown bear management in Austria was the lack of public education. Ten of 11 farmers interviewed in central Austria had no information about bear management. Most ($n = 10$) reported that local people were never asked their opinion on reintroducing bears in the area in the 1980s. All farmers interviewed disliked bears and bear managers ($n = 11$).

One primary management problem in central Italy was lack of cooperation between the Abruzzo National Park (ANP) and the surrounding Forest Service area. Several simultaneous research projects were being conducted by both agencies, but no exchange of research findings had been reported (M. Posillico, IFS, Abruzzo, Italy, personal communication, 1995). The ANP has not published findings of their telemetry study on the bear population.

The main conservation problem for bears identified in the single interview conducted in Sweden was poaching in the reindeer areas. The government had been trying to reduce poaching by involving reindeer herders in the design of a new management plan with improved

Table 5. Brown bear population management in 6 European countries until 1996.

	Austria	Abruzzo	Norway	Northern Slovenia	Southern Slovenia	Sweden	Romania
Population status							
Bears reintroduced	yes	no	no	no	no	no	no
Status	protected	protected	protected	protected	hunted	hunted	hunted
Population trend ^a	increasing	decreasing	increasing	increasing	increasing	increasing	increasing
Population status ^a	highly endangered	endangered	endangered	endangered	viable	viable	viable
Management plan							
Type	comprehensive plan in progress	policy memos	comprehensive plan	policy memos	policy memos	comprehensive plan	harvest plan
Written by	WWF, WGM, IGJ ^b	memos of IFS and ANP ^c	Parliament and Ministry of Environment	Ministry of Forestry and Agriculture	Ministry of Forestry and Agriculture	Environmental Protection Agency	Ministry of Environment
Issues addressed		protection zoning, research monitoring	population goal, zoning, damage compensation, education	damage compensation	hunting quotas, core area, feeding, population estimation	hunting quota, damage compensation, zoning, research needs	hunting quotas
Management responsibilities							
Zoning ^d	no	no	yes	yes	yes	no	no
Reserves	no	yes	no	no	no	no	no
Damage compensation	yes	yes	yes	yes	yes	yes	yes
Feeding	no	ANP ^c	no	no	yes	no	yes
Problem bear management							
Responsible institution	country	IFS ^c	country Directorate for Nature	foresters hunters	Ministry of Forestry Slovenian Hunters Association	EPA ^d	ROMSILVA ^e
Reported to	bear specialist	foresters police	carnivore specialist	foresters hunters	foresters hunters	carnivore specialist hunters	foresters hunters
Hunting							
Hunting limits					quotas	quotas	female quotas
Methods					from fixed elevated stands only	still hunting	elevated stands, dog chase
Amount harvested (%) ^f					40 (10%)	35 (5%)	600 (10-15%)

^a Information from references (Table 1) for specific countries and from interviews with individuals.

^b WWF = World Wildlife Fund WGM = Munich Wildlife Society, IGJ = Institute for Wildlife Management at the Bodenkultur University in Vienna.

^c ANP = Abruzzo National Park, Italy, IFS = Italian Forest Service.

^d EPA = Swedish Environmental Protection Agency.

^e ROMSILVA = Romanian Forest Service.

^f % of total bear population

compensation regulations (A. Björvall, Swedish EPA, Stockholm, Sweden, personal communication, 1995). In Norway, the main challenge to bear management seemed to be the coexistence of sheep farmers and bears. With increasing bear numbers, damage to sheep inevitably increased. A complaint of local sheep farmers ($n = 3$) was the inefficient handling of problem bear kills by hired local hunters.

DISCUSSION

The data we collected provided a basis for comparing the bear management policies, administration, and problems of several European countries. Our sampling was not strictly random, and sample sizes for individual countries were small, thus we had little power to make statistical inferences from the data. Moreover, some information was lost during translation of interviews to English. Nevertheless, the study revealed several patterns of brown bear management in Europe and suggested ways to improve the success of brown bear conservation efforts.

Bear Management Programs

Two philosophical approaches to brown bear management were evident among the 6 European countries surveyed. Norway, northern Slovenia, and Austria managed bears from a preservationist perspective, fully protecting the resource and maintaining it in its natural state (Owen and Chiras 1990, Meffe and Carrol 1994). In these countries, bear populations were small and were not hunted or fed to manipulate population growth. In Italy the approach to bear management was similar except that bears were fed to increase survival. In contrast, Romania, southern Slovenia, and Sweden practiced a conservationist approach, where priority was assigned to maintaining and using a sustainable surplus of the resource, but ensuring through management that the resource was available for future generations (Owen and Chiras 1990, Meffe and Carrol 1994). These countries have regular hunting seasons and bear populations that are viable and thought to be stable or increasing. Management philosophy in the former countries might change as their bear populations grow to where they can support bear harvest. Sweden resumed a limited hunting season in the 1960s after the bear population recovered from a bottleneck of about 40 bears to about 400 bears in 20 years (Swenson et al. 1994).

An advantage of the conservationist approach is that hunters have a reason to protect bears and support bear management programs and agencies; the larger the bear population, the larger the hunting quota in the future.

For this reason, in Romania, southern Slovenia, and Sweden, bear management has a history of cooperation between government and NGO's (primarily hunting associations), in contrast to countries with a preservationist approach, where, excepting Austria, government agencies were solely in charge. Having the cooperation of NGO's can offer valuable management tools, such as a hunting public and hunters to estimate bear population size by counting bears at bait stations. In addition, hunting associations in Austria, Slovenia, and Sweden financially support damage compensation. In Romania, Slovenia, and Italy, NGO's oversee supplementary feeding of bears to increase the populations. If done in accordance with a country's conservation goal, this can be advantageous; however, it could be viewed as detrimental to bear management efforts if, by boosting the population, bear problems increase (e.g., livestock depredation) and encourage poaching (e.g., in Italy).

One apparent problem, however, with cooperative management between governments and NGOs, is that more parties are involved in management decisions, which can become administratively cumbersome. In southern Slovenia, which is managed mainly by the Slovenian Hunters Association (SHA), it has been difficult to coordinate reporting of bear damage or to standardize management practices with the rest of the country, where the Ministry of Forestry and Agriculture oversees bear management. This has been a problem because unavailable damage reports make it difficult to allocate federal money to hunting districts and to coordinate problem bear management.

We believe that cooperative bear management between governmental agencies and NGO's can be beneficial if a clear hierarchy for management decisions is established among all involved parties to deliver efficient problem bear management and damage compensation. In countries where bear hunting is not a tradition and cooperation with hunting associations has no previous history, we recommend a governmental management approach. Governmental agencies also should consider stakeholder opinions or cooperation from people other than hunters (e.g., farmers, beekeepers, and outdoor recreationists) in their bear management. The support of local people to conserve bears can be increased by a well-functioning bear management system which increases tolerance of bear damage (e.g., cooperation of reindeer herders and government for bear management in Sweden; Olsen 1991, Wagner 1997).

Damage Prevention and Compensation

Paying farmers for damage inflicted by bears has been a controversial issue in Europe and the USA (Wagner

1997, Klenzendorf, unpublished data). One philosophy is that carnivore damage is a natural risk in farming, similar to bad weather or lightning. Others argue that local people should not be expected to sacrifice part of their livelihood for a status symbol that is wanted by the population as a whole (Olsen 1991, Wagner 1997). Whereas damage compensation does not solve the problem of damage itself, it may serve to increase the tolerance of farmers to damage (Olsen 1991). In the United States, 19 of 46 states with bears offer compensation for damage; 34 states offer materials to prevent damage, such as fencing of beehives (Wagner 1997).

As in the U.S. (Wagner 1997), farmers in Italy and Romania stated that they were more frustrated by their malfunctioning and inadequately paying compensation program than they would be if they had none at all. Fico et al. (1993) also reported that poaching of bears in central Italy is high due to a malfunctioning compensation system. From 1980–85, 22 bears were killed by poaching and traffic accidents outside Abruzzo National Park (Fico et al. 1993). Poaching may be encouraged by the long waiting period for compensation money, which can take up to 8 years. The bear population there has been declining, and conservation efforts, such as improving the compensation system to stop poaching, might slow or reverse the process (R. Fico, IFS, Abruzzo, Italy, personal communication, 1996). Poaching in Romania, where the compensation system also functions poorly, was not perceived to be a large problem by authorities because shepherds and farmers are mostly too poor to own weapons.

To compensate farmers faster, Slovenia was experimenting with a government-owned sheep herd that replaced farmers' sheep directly rather than paying money. Problems occurred with this system since it was administratively expensive and farmers preferred to pick their own sheep rather than those offered by the government (A. Simonc, Slovenian Ministry of Agriculture, Ljubljana, Slovenia, personal communication, 1995).

Preventive measures to reduce bear damage in Europe mainly included feeding of bears, electric fencing of beehives, keeping livestock close to human development, and using herding dogs and sheep herders to protect livestock. Feeding bears seemed to reduce damage in southern Slovenia, although a scientific study of the relationship between feeding and damage reduction has never been done (F. Knauer and P. Kaczensky, WGM, Linderhof, Germany, personal communication, 1995). Craighead et al. (1995) supported the hypothesis that feeding bears reduces the area necessary for a population to survive and minimizes bear–human conflicts by concentrating bears away from people. Others have argued

that feeding increases habituation and food conditioning, leading to increased management problems (Herrero 1985, Jope 1985, Mattson et al. 1992). Herrero (1985) considered food-conditioned bears to be dangerous and prone to injuring people. Feeding of bears is therefore ethically controversial and has to be evaluated for each country separately (Munich Wildlife Society 1997).

Electric fencing of beehives has successfully reduced damage by bears as long as a bear has not raided the hives before (Singer 1995). Electric fencing of beehives seems to reduce bear damage in all study countries but is financially only feasible if bear damage is likely in the area. In areas with infrequent bear damage to hives, it might be financially more feasible to pay for sporadic damage incidents.

The use of shepherds and herding dogs to prevent bear damage is labor intensive and expensive and was abandoned in countries where bears had been extirpated (e.g., Norway, northern Slovenia, and Austria). Perhaps as a consequence, sheep depredation in these areas is higher, relative to the size of their bear populations, than in other areas. Unfortunately, farmers there are not willing and often financially not able to invest in shepherds for their livestock because sheep farming is a supplemental income. Even though Sweden has more sheep and bears than Norway, more damage to sheep occurs in Norway, perhaps because sheep in Norway roam the forest unguarded all summer long, whereas in Sweden, sheep are kept close to houses and seem to be less vulnerable to predation by bears. In addition, the breed of sheep in Norway does not stay together in herds, but disperses for grazing during the day. Warren and Myrsterud (1995) observed that single sheep are much more vulnerable to predation than flocking sheep. A change from sheep to cattle farming might help reduce bear damage in many areas of Europe, but is expensive.

We observed that in countries where the government is willing to subsidize damage prevention (Austria, Norway, Sweden, Slovenia), people reported less poaching. We believe that fast, adequate compensation payments in Europe can increase the tolerance of farmers for bear damage to livestock and property. An increased tolerance might reduce poaching and aid in the preservation of Europe's bear populations (Olsen 1991, Fico et al. 1993, Munich Wildlife Society 1997).

Problem Bear Management

Italy, Austria, northern Slovenia, and Norway have small bear populations, and the elimination of 1 bear, especially a female, may seriously affect the viability of the population. Craighead and Craighead (1971) argued that loss of any female in Yellowstone National Park's

grizzly bear population was detrimental to the population, and they recommended killing bears only in extreme cases of habituation to people. In contrast, Meagher and Fowler (1989) hypothesized that brown bears in Yellowstone might become more endangered if nuisance females are not shot, because cubs often learn nuisance behavior and end up being killed also. Bear populations in Norway, Austria, and northern Slovenia are currently small enough that an offending bear can usually be located. However, with increasing populations, this task might become more difficult.

In Norway, it has been very difficult to obtain a permit in the protective core areas along the Swedish border because by law, female bears cannot be shot at all, and it is difficult to distinguish a female from a male (P. Wabakken, Norwegian Institute of Nature Research, Trondheim, Norway, personal communication, 1995). In addition, the issuance of a license has become much more restricted than in the past, when bear numbers in Norway were overestimated and it was easier to receive a kill permit (Kolstad et al. 1986, Swenson et al. 1995). In 1991, a kill permit was issued after 3 sheep were killed in South Trondelag. In 1995, a permit was issued only after 40–50 sheep had been killed (P. Wabakken, Norwegian Institute of Nature Research, Trondheim, Norway, personal communication, 1995). If a permit is issued, local hunters participate in the hunt and often do not have the experience to succeed in killing the problem bear (Myserud 1980). In general, Norwegian farmers liked to see professionals kill a problem bear as fast as possible (interviews $n = 3$).

Relocation as a management tool is not feasible in most European countries since the bear areas are too small, and the regions are too densely populated, and bears can return to their home ranges within days. Studies in the U.S. have shown that bears should be relocated >64 km to avoid a return of the bear (Comly 1993). Aversive conditioning has been tried in the past, but it requires a lot of time and money to do properly (Knauer et al. 1994, Wagner 1997). If a bear is aversively conditioned early in the process of habituation, it is possible to reverse the behavior at least for some time (Herrero 1985). If a bear has experienced frequent human contact, however, a successful aversive conditioning is unlikely (Cole 1971, 1973; McCullough 1982, Herrero 1985).

MANAGEMENT IMPLICATIONS

The success of many large carnivore conservation projects lies in damage management (Olsen 1991, Wagner 1997). Although the annual economic loss to bears in many European countries is below U.S.

\$300,000, damage incidents by bears always receive great media attention and cause people to fear for their safety (Munich Wildlife Society 1997). Also, even if damage nationwide is small (e.g., Italy, northern Slovenia, Norway), local impact can be large (Warren and Myserud 1995, Wagner 1997, Italian Forest Service, Abruzzo, Italy, unpublished data). Damage compensation does not reduce problems, but may increase tolerance of farmers to bear damage (Wagner 1997).

We recommend that European countries focus on establishing a quick and well functioning compensation program that can help reduce negative attitudes toward bears and reduce the pressure on an individual suffering damage. In addition, a common management approach for dealing with dangerous situations is needed. As the problem situation in Austria during 1994 has shown, bureaucracy should be structured efficiently to allow issuing kill permits quickly. Ideally, 1 permit should be issued/problem bear and not/county the bear is in. Since there are only a small number of female brown bears in most western European populations at the moment, it will be a difficult decision to deal with a problem female bear. We propose, however, if an offending female has caused extensive damage and poses a threat to human safety, it should be eliminated. Decisive, quick actions of this sort should improve public support for bear conservation.

Efforts to gain local support should concentrate on informing the public of actions taken and educating them about bears and the goals of bear management. Public support has been recognized as the key for success in wildlife management (Conover and Decker 1991, Conover 1994). Another key to success seems to be local involvement in management decisions. Poaching rates of brown bears seemed to decline after a cooperative management plan between reindeer herders and the Swedish government was established (A. Bjärvall, Swedish Environmental Protection Agency, Stockholm, Sweden, personal communication, 1995). Wildlife managers with knowledge of the land around them and contact with the local population can work more effectively and quickly because they can establish a trust by local stakeholders (Munich Wildlife Society 1997). A management plan should be available for everyone and should be written in clear terms that avoid confusion.

We believe that there is no straightforward answer to the problem of brown bear damage in European countries. Given the diversity in politics and in financial resources available to subsidize damage prevention, the answer is different for each country. In Austria, for example, reduction of bear damage could be achieved by providing more electric fencing for beekeepers, whereas

in Norway, a change from free-ranging sheep husbandry to either cattle or fenced enclosures near farms is an option.

In countries with a high human population, problems with large carnivores are inevitable. It is important, however, that the local people are not left alone in paying for a status symbol that is wanted by the population as a whole.

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APPENDIX A

Interview guide for wildlife managers, hunters, and governmental officials in a survey in 6 European countries during 1995–96.

1. Which organizations are involved in the management of brown bears in (*name of area*)?
2. Who designs the management plan?
3. a) Which of the following are addressed in the management plan?
 - behavioral research
 - population research
 - other research (e.g., habitat)
 - education (public and employees)
 - management actions (e.g., aversive conditioning, relocation, destruction, closures)
 - harvest levels
 - law enforcement (e.g., poaching prevention)
 - preventive actions (food storage, fencing of beehives)
 - regulated reporting of incidents (central agency for reports)
 - monitoring
- b) Are local managers able to modify the plan, if they were not involved in the design? In what way?
4. a) How would you characterize the relationship between (*name of area*) to the organization (e.g., Forest Service) that writes the bear management plan?
 - 1) good cooperation with regular meetings
 - 2) good cooperation with irregular meetings
 - 3) cooperation with yearly reports
 - 4) no cooperation
- b) Please specify how cooperation is organized.
5. Who are the people involved in various aspects of bear management (e.g., handling damage claims, research, education, aversive conditioning, etc.) in (*name of area*)? What are their duties?
 - a) permanent rangers:
 - b) park biologist:
 - c) local hunters:
 - d) game wardens:
 - e) foresters:
 - f) NGO's:
 - g) other:

6. What is your role in the bear management of (*name of area*)?
7. What is the decision-making process when, for example, a bear has to be destroyed (i.e. who has the ultimate responsibility)?
8. What are the strengths of your management approach?
9. Do you have any suggestions what could be improved with the current plan?
10. Are bears fed? If so, describe what is fed; where, how often, by whom, and for what reason?
11. What kind of problems do you have with bears?
List the number of each type reported each year.
Property damage:
Breaking into houses:
Beehive damage:
Personal injury:
Livestock depredation:
Garbage:
Trespassing through towns:
Other:
12. What actions are taken to prevent each of the above types of problems? (e.g., electric fencing, livestock guardian dogs, etc.).
13. Does the state promote or subsidize preventions? In what way?
14. What months do these problems occur most? List each separately.
15. Where do these problems occur? (Can you point out on a map?)
16. Who are these problems reported to? (Can I obtain reports?)
17. Do you read these reports? Why or why not?
18. What is the reporting rate? (How will they know if not reported?)
19. Is damage compensated by the state? If so
 - a) How does it work? Are there problems with the system?
 - b) Is proof of damage required for compensation?
 - c) Is compensation adequate?
 - d) Are people content with the system?
20. Is the public informed about bears and their behavior (public lectures, brochures, school, etc.)?
21. Do local residents know what is done to manage bears (public lectures, brochures, etc.)?
22. If a management plan exists, do people adhere to the plan (do they support your organization in enforcing management regulations)?
23. What conflicts, if any, occur between local residents and the organization responsible for bear management in (*name of area*)?
24. Do people accept the presence of the bears (e.g. are bears portrayed in a positive or negative way by the media)?
25. Were bears introduced to your area from elsewhere?
26. If yes, how would you rate the reactions of each of the following groups, using a scale of: 1 = strongly favored; 2 = favored; 3 = neutral; 4 = disliked; 5 = strongly disliked
national farmers:
local farmers:
national others:
local others:
national officials:
local officials:
national media:
local media:
tourists:
other:
27. Please explain each group in more detail.
28. What are the seasonal shortages in natural food abundance for bears in (*name of area*)?
29. Do they coincide with the timing of damage reports?
30. What is the population status of the bear? Are numbers increasing, stable, decreasing? How reliable are these numbers (i.e. how were they measured?)
31. What is the conservation status of the bear here?
 - a) Is it hunted? If yes: certain times, sex, weight, who hunts and how is the hunt organized?
 - b) Is it protected year round?
 - c) What is your estimate of poaching each year?

APPENDIX B

Interview guide for farmers and shepherds in 6 European countries during 1995–96.

1. What do you do if a bear has taken livestock or has damaged property?
2. What measures do you take to prevent damage?
3. Does the state provide information/help with these measures?
4. What do you like/dislike about bear management in general?
5. What do you like about the compensation program?
6. Do you have suggestions on how to improve it?

